

IN THE CLAIMS

This listing of the claim will replace all prior versions and listings of claim in the present application.

Listing of Claims

1. (currently amended) A storage system comprising:

a storage controller for controlling the storage system; and
at least one disk device for storing data from said storage controller,
wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O) request based on file-name indication from an information processing device through a network, transmitting/receiving data to/from the information processing device and outputting a block access I/O request corresponding to the file access I/O request;

a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller;

a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and

a data transfer network connected to said channel controller, said disk controller and said first memory,

wherein the channel controller is equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request

and the data sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit module, and

wherein the second processor transmits information indicating the storage position of the data in the second memory to the first processor, the first processor writes into the third memory data transfer information containing information indicating the storage position of the data in the first memory and information indicating the storage position of the data in the second memory, and the data transfer device reads out the data transfer information from the third memory and controls the data transfer between the first memory and the second memory based on the data transfer information thus read out.

2. (currently amended) A storage system comprising:

a storage controller for controlling the storage system; and

at least one disk device for storing data from said storage controller,

wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O) request based on file-name indication from an information processing device through a network, transmitting/receiving data to/from the information processing device and outputting a block access I/O request corresponding to the file access I/O request;

a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller;

a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and

a data transfer network connected to said channel controller, said disk controller and said first memory,

wherein the channel controller is equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data which is sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit board, and

wherein the second processor transmits information indicating the storage position of the data in the second memory to the first processor, the first processor writes into the third memory data transfer information containing information indicating the storage position of the data in the first memory and information indicating the storage position of the data in the second memory and transmits the storage position of the data transfer information in the third memory to the data transfer device, and the data transfer device reads out the data transfer information from the third memory

and controls the data transfer between the first memory and the second memory based on the data transfer information thus read out.

3. (currently amended) A storage system comprising:

a storage controller for controlling the storage system; and

at least one disk device for storing data from said storage controller,

wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O) request based on file-name indication from an information processing device through a network, transmitting/receiving data to/from the information processing device and outputting a block access I/O request corresponding to the file access I/O request;

a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller;

a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and

a data transfer network connected to said channel controller, said disk controller and said first memory,

wherein the channel controller is equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data sent from/to the information processing device, a data transfer

device for controlling data transfer between the first memory and the, second memory, and a third memory controlled by the first processor, which are formed on a circuit module, and

wherein the first processor writes into the third memory first data transfer information containing information indicating the storage position of the data in the first memory, the second processor writes into the second memory second data transfer information containing information indicating the storage position of the data in the second memory, and the data transfer device reads out the second data transfer information from the second memory, reads out the first data transfer information from the third memory, and controls the data transfer between the first memory and the second memory based on the first data transfer information and the second data transfer information.

4. (currently amended)A storage system comprising:

a storage controller for controlling the storage system; and

at least one disk device for storing data from said storage controller,

wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O)

request based on file-name indication from an information processing device

through a network, transmitting/receiving data to/from the information

processing device and outputting a block access I/O request corresponding to

the file access I/O request;

a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller; and

a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and

a data transfer network connected to said channel controller, said disk controller and said first memory,

wherein the channel controller is equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit module, and

wherein the first processor writes into the third memory first data transfer information containing information indicating the storage position of the data in the first memory, the second processor writes into the second memory second data transfer information containing information indicating the storage position of the data in the second memory, the second processor transmits information indicating the storage position of the second data transfer information to the first processor, the first processor transmits to the data transfer device transfer start information containing information indicating the storage position of the first data transfer information and information

indicating the storage position of the second data transfer information, and the data transfer device reads out the second data transfer information from the second memory based on the transfer start information, reads out the first data transfer from the third memory on the basis of the transfer start information, and controls the data transfer between the first memory and the second memory based on the first data transfer information and the second data transfer information.

5. (currently amended) The storage system according to any one of claims 1 to 4, wherein the data transfer device writes into the third memory information indicating the result of the data transfer carried out between the first memory and the second memory.

6. (currently amended) A storage system comprising:
a storage controller for controlling the storage system; and
at least one disk device for storing data from said storage controller,
wherein said storage controller comprises:
a channel controller for receiving a file access input/output (I/O) writing request based on a file-name indication, writing data from an information processing device through a network and outputting a block access I/O write request corresponding to the file access I/O writing request;
a disk controller for writing the writing data into a storage volume in which data are stored based on the block access I/O write request;

a first memory including a cache memory for temporarily storing the writing data transmitted/received between the channel controller and the disk controller; and

a data transfer network connected to said channel controller, said disk controller and said first memory,

wherein the channel controller contains a first processor for outputting the block access I/O write request corresponding to the file access I/O writing request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to receive the file access I/O writing request and the writing data from the information processing device, a data transfer device for controlling the data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit module, and

wherein the first processor writes into the third memory first data transfer information containing information indicating the storage position of the writing data in the first memory, the second processor writes into the second memory second data transfer information containing information indicating the storage position of the writing data in the second memory and transmits information indicating the storage position of the second data transfer information to the first processor, the first processor transmits the data transfer device transfer start information containing information indicating the storage position of the first data transfer information and information indicating the storage position of the second data transfer information, the data transfer device reads out the second data transfer information from the

second memory based on the transfer start information, reads out the first data transfer information from the third memory based on the transfer start information and transfers the writing data from the second memory to the first memory based on the first data transfer information and the second data transfer information, and the disk controller writes into the storage volume the writing data stored in the first memory on the basis of the write request.

7. (currently amended) A storage system comprising:

a storage controller for controlling the storage system; and

at least one disk device for storing data from said storage controller,

wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O) read-out request based on a file-name indication from an information processing device through a network, transmitting to the information processing device read-out data read out from a storage volume for storing data and outputting a block access I/O read request corresponding to the file access I/O read-out request;

a disk controller for reading out the read-out data from the storage volume based on the block access I/O read request;

a first memory including a cache memory for temporarily storing the read-out data transmitted/received for the storage volume between the channel controller and the disk controller; and

a data transfer network connected to said channel controller, said disk controller and said first memory,

wherein the channel controller comprises a first processor for outputting the block access I/O read request corresponding to the file access I/O read-out request and controlling the first memory, a file access circuit which has a second processor and a second memory for controlling the second processor and receives the file access I/O read-out request from the information processing device, a data transfer device for controlling the data transfer between the first memory and the second memory, and a third memory controlled by the first memory, which are formed on a circuit board, and

wherein the disk controller writes into the first memory the read-out data read out from the storage volume based on the read request, the first processor writes into the third memory first data transfer information containing information indicating the storage position of the read-out data in the first memory, the second processor writes into the second memory second data transfer information containing information indicating the storage position of the read-out data in the second memory and transmits information indicating the storage position of the second data transfer information to the first processor, the first processor transmits to the data transfer device transfer start information containing information indicating the storage position of the first data transfer information and information indicating the storage position of the second data transfer information, the data transfer device reads out the second data transfer information from the second memory based on the transfer start information, reads out the first data transfer information from the third memory based on the transfer start information and transfers the read-out data from the first memory to the second memory on

the basis of the first data transfer information and the second data transfer information, and the second processor transmits the read-out data stored in the second memory to the information processing device.

8. (currently amended) A control method for a storage system including a storage controller for controlling the storage system; and
at least one disk device for storing data from said storage controller,
wherein said storage controller comprises:
a channel controller for receiving a file access input/output (I/O) request based on file-name indication from an information processing device through a network, transmitting/receiving data to/from the information processing device and outputting a block access I/O request corresponding to the file access I/O request; a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller; a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and a data transfer network connected to said channel controller, said disk controller and said first memory, the channel controller being equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second

memory, and a third memory controlled by the first processor, which are formed on a circuit board, said control method comprising the steps of:

transmitting, by the second processor, information indicating the storage position of the data in the second memory to the first processor;

writing, by the first processor, into the third memory data transfer information containing information indicating the storage position of the data in the first memory and information indicating the storage position of the data in the second memory; and

by the data transfer device, reading out the data transfer information from the third memory, and controlling the data transfer between the first memory and the second memory based on the data transfer information thus read out.

9. (currently amended) A control method for a storage system

including a storage controller for controlling the storage system; and

at least one disk device for storing data from said storage controller,

wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O)

request based on file-name indication from an information processing device

through a network, transmitting/receiving data to/from the information

processing device and outputting a block access I/O request corresponding to

the file access I/O request; a disk controller for carrying out input/output

control of data stored in a storage volume for storing the data based on the

block access I/O request output by said channel controller; a first memory

including a cache memory for temporarily storing the data delivered between

the channel controller and the disk controller, and a data transfer network connected to said channel controller, said disk controller and said first memory, the channel controller being equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit module, said control method comprising the steps of:

transmitting, by the second processor, information indicating the storage position of the data in the second memory to the first processor;

by the first processor, writing into the third memory data transfer information containing information indicating the storage position of the data in the first memory and information indicating the storage position of the data in the second memory, and transmitting the storage position of the data transfer information in the third memory to the data transfer device; and

by the data transfer device reading out the data transfer information from the third memory, and controlling the data transfer between the first memory and the second memory based on the data transfer information thus read out.

10. (currently amended) A control method for a storage system including a storage controller for controlling the storage system; and

at least one disk device for storing data from said storage controller,

wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O) request based on file-name indication from an information processing device through a network, transmitting/receiving data to/from the information processing device and outputting a block access I/O request corresponding to the file access I/O request; a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller; a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and a data transfer network connected to said channel controller, said disk controller and said first memory, the channel controller being equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data which is sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit board, said control method comprising the steps of:

writing, by the first processor into the third memory first data transfer information containing information indicating the storage position of the data in the first memory;

writing, by the second processor, into the second memory second data transfer information containing information indicating the, storage position of the data in the second memory; and

by the data transfer device, reading out the second data transfer information from the second memory, reading out the first data transfer information from the third memory, and controlling the data transfer between the first memory and the second memory based on the first data transfer information and the second data transfer information.

11. (currently amended) A control method for a storage system including a storage controller for controlling the storage system; and
at least one disk device for storing data from said storage controller,
wherein said storage controller comprises:
a channel controller for receiving a file access input/output (I/O) request based on file-name indication from an information processing device through a network, transmitting/receiving data to/from the information processing device and outputting a block access I/O request corresponding to the file input/output request; a disk controller for carrying out input/output control of data stored in a storage volume for storing the data based on the block access I/O request output by said channel controller; a first memory including a cache memory for temporarily storing the data delivered between the channel controller and the disk controller; and a data transfer network connected to said channel controller, said disk controller and said first memory, the channel controller being equipped with a first processor for outputting the block access I/O request corresponding to the file access I/O

request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to control the transmission/reception of the file access I/O request and the data which is sent from/to the information processing device, a data transfer device for controlling data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit module, said control method comprising the steps of:

writing, by the first processor, into the third memory first data transfer information containing information indicating the storage position of the data in the first memory;

writing, by the second processor, into the second memory second data transfer information containing information indicating the storage position of the data in the second memory;

transmitting, by the second processor, information indicating the storage position of the second data transfer information to the first processor;

transmitting, by the first processor, to the data transfer device transfer start information containing information indicating the storage position of the first data transfer information and information indicating the storage position of the second data transfer information; and

by the data transfer device, reading out the second data transfer information from the second memory based on the transfer start information, reading out the first data transfer from the third memory, based on the transfer start information, and controlling the data transfer between the first memory and the second memory based on the first data transfer information and the second data transfer information.

12. (original) The control method according to any one of claims 8 to 11, wherein the data transfer device writes into the third memory information indicating the result of the data transfer carried out between the first memory and the second memory.

13. (currently amended) A control method for a storage system including a storage controller for controlling the storage system; and
at least one disk device for storing data from said storage controller,
wherein said storage controller comprises:
a channel controller for receiving a file access input/output (I/O) writing request based on a file-name indication, writing data from an information processing device through a network and outputting a block access I/O write request corresponding to the file access I/O writing request; a disk controller for writing the writing data into a storage volume in which data are stored based on the block access I/O write request output by said channel controller; a first memory including a cache memory for temporarily storing the writing data transmitted/received between the channel controller and the disk controller; and a data transfer network connected to said channel controller, said disk controller and said first memory, the channel controller being equipped with a first processor for outputting the block access I/O write request corresponding to the file access I/O writing request and controlling the first memory, a file access circuit which has a second processor and a second memory controlled by the second processor and serves to receive the file access I/O writing request and the writing data from the information

processing device, a data transfer device for controlling the data transfer between the first memory and the second memory, and a third memory controlled by the first processor, which are formed on a circuit module, said control method comprising the steps of:

writing, by the first processor, into the third memory first data transfer information containing information indicating the storage position of the writing data in the first memory;

by the second processor, writing into the second memory second data transfer information containing information indicating the storage position of the writing data in the second memory, and transmitting information indicating the storage position of the second data transfer information to the first processor;

transmitting, by the first processor, the data transfer device transfer start information containing information indicating the storage position of the first data transfer information and information indicating the storage position of the second data transfer information; and

by the data transfer device, reading out the second data transfer information from the second memory based on the transfer start information, reading out the first data transfer information from the third memory based on the transfer start information, and transferring the writing data from the second memory to the first memory based on the first data transfer information and the second data transfer information; and

writing, by the disk controller into the storage volume the writing data stored in the first memory based on the write request.

14. (currently amended) A control method for a storage system including a storage controller for controlling the storage system; and
at least one disk device for storing data from said storage controller,
wherein said storage controller comprises:

a channel controller for receiving a file access input/output (I/O) read-out request based on a file-name indication from an information processing device through a network, transmitting to the information processing device read-out data readout from a storage volume for storing data and outputting a block access I/O read request corresponding to the file access I/O read-out request; a disk controller for reading out the read-out data from the storage volume based on the block access I/O read request output by said channel controller; a first memory including a cache memory for temporarily storing the read-out data transmitted/received between the channel controller and the disk controller; a data transfer network connected to said channel controller, said disk controller and said first memory, the channel controller being equipped with a first processor for outputting the block access I/O read request corresponding to the file access I/O read-out request and controlling the first memory, a file access circuit which has a second processor and a second memory for controlling the second processor and receives the file access I/O read-out request from the information processing device, a data transfer device for controlling the data transfer between the first memory and the second memory, and a third memory controlled by the first memory, which are formed on a circuit module, said control method comprising the steps of:

writing, by the disk controller, into the first memory the read-out data readout from the storage volume based on the read request;

writing, by the first processor, into the third memory first data transfer information containing information indicating the storage position of the read-out data in the first memory;

by the second processor, writing into the second memory-second data transfer information containing information indicating the storage position of the read-out data in the second memory and transmitting information indicating the storage position of the second data transfer information to the first processor;

transmitting, by the first processor, to the data transfer device transfer start information containing information indicating the storage position of the first data transfer information and information indicating the storage position of the second data transfer information;

by the data transfer device, reading out the second data transfer information from the second memory based on the transfer start information, reading out the first data transfer information from the third memory based on the transfer start information and transferring the read-out data from the first memory to the second memory based on the first data transfer information and the second data transfer information; and

transmitting, by the second processor the read-out data stored in the second memory to the information processing device.